

★ Boiler ★

VOC emissions from natural gas fired boilers have been determined to be fuel related, calculated based on the AP-42 Table 1.4-3 emission factor of 2.78 lb/MM ft³ of fuel fired specified for "Small Industrial Boilers" (48% of 5.8 lb/MM ft³ total organic carbon). At 100 MM Btu/hr firing rate, using 1035 Btu/ft³ heating value, the boiler will burn 96,618 CFH of natural gas fuel. This works out to a VOC emission of 0.27 pph. Solvay is proposing no add on control for this boiler.

The predicted boiler VOC emissions are inherently low, compared with other fuels. Because this boiler will use a low emitting fuel, and because the resultant VOC emissions are insignificant, the Division will accept Solvay's proposal as representing BACT and require no additional VOC control in this case.

★ Housekeeping Dust Collection Systems ★

Once again, typical VOC emission rates from other plant stacks have been shown to be quite low, so the Division has determined that no VOC control will be required on these housekeeping sources, either.

★ Mine Exhaust ★

The mine vent has existed at the plant from its inception, but it has only recently been determined that the vent is a source of significant VOC emissions. Solvay projects approximately 115 pph of VOC emissions from their proposed operation, based on testing of the existing mine ventilation shaft showing a VOC concentration of 0.0113 gr/dscf. The new mine exhaust shaft will have an air flow of approximately 1,500,000 acfm (1.2 MM dscfm), which is more than five times the exhaust rate of the new calciner, while the VOC concentration is approximately 25% of that from the AQD #48 stack. Since it has been shown to be uneconomical to control stronger concentrations at lower flows, it is clearly also uneconomical to control VOC from the mine vent.

Hazardous Air Pollutant Emissions

Because HAP's are a subset of VOC's, and because the cost of controlling VOC's has been determined to be excessive, by the same reasoning the Division will require no add-on control for HAP emissions.

Carbon Monoxide Emissions

★ Calciner ★

The new AQD #80 trona calciner natural gas **burner** will have design CO emission rates of 28.00 pph, based on a manufacturer's projection of 46 ppm CO outlet concentration in the burner exhaust. This is only the "fuel related" portion of CO emissions, coming from combustion of natural gas the burner. At the design firing rate of 400 MM Btu/hr, the 28.00 pph works out to 0.07 lb per million Btu fired. In any combustion process, there is a natural trade off between NO_x and CO emissions, with CO emission rising (incomplete hydrocarbon combustion) as excess combustion air is reduced to control NO_x emissions. Nitrogen oxides are the more critical of the two pollutants from the human health and welfare perspective, and given the "Low NO_x" performance of the burner, the Division is satisfied that the predicted CO performance of the proposed AQD #80 burner represents the state of the art for this type of emission source, and acceptably satisfies BACT for CO.

Another aspect of calciner CO evaluation revolves around "process related" CO emissions. All of the CO that exits the stack, does not necessarily come from fuel combustion in the burner. Some CO has been shown to be generated by partial combustion of the VOC's driven off the trona ore in the hot atmosphere at the front end of the calcining kiln, or from the chemical breakdown of the bicarbonate portion of the trona ore crystal. Another trona industry operator (Texasgulf) conducted diagnostic testing on new calciner burners in 1993, after finding that their stack emissions were well above the carbon monoxide limit of 8.00 pph set into a permit for those new gas burners. Samples were taken from ports in the ceiling of the burner fire box and from the burner throat connecting the fire box to the calciner kiln. These samples showed very low CO concentrations, in the range of 2 - 5 ppmv. Additional sampling showed CO concentrations around 170 ppmv in the calciner stack exhaust. There were no VOC's found in the samples taken from the burner end of the kiln, but there were significant concentrations of these compounds found in the stack (77 ppmv). Based on this work, it is clear that a portion of the CO emission is a function of ore composition, with no emission reductions available from the calciner equipment, itself.

Solvay has conducted CO testing on existing calciners which indicates a carbon monoxide emission rate of 3.81 pounds per ton of ore. At the 275 TPH feed rate to AQD #80, this calculates to 1,047.75 pph (4,589 TPY) from the calciner stack. As the Division is convinced it is not technically feasible to control this trona based CO emission, no add-on control requirement for BACT of calciner CO emissions is proposed.

★ Dryer ★

The new AQD #82 trona dryer natural gas burner will have design burner "fuel related" CO emission rates of 14.00 pph, based on a manufacturer's projection of 42 ppm CO outlet concentration in the burner exhaust. At the design firing rate of 200 MM Btu/hr, this works out to 0.07 lb/MM Btu. There are no hydrocarbons or bicarbonate compound in the wet monohydrate crystal feed to form process material related CO emissions in a soda ash dryer.

Because of the inverse relationship between NO_x and CO emissions, carbon monoxide emissions will be somewhat higher from the AQD #82 dryer stack with its "Low NO_x " burner performance, than they would be from a conventional burner. As noted above, nitrogen oxides are the more critical of the two pollutants from the human health and welfare perspective, thus the Division is again satisfied that the predicted CO performance of the proposed AQD #82 "Low NO_x " burner acceptably satisfies BACT for CO.

★ Boiler ★

The new AQD #85 natural gas boiler will have a design burner CO emission rate of 9.0 pph, based on a manufacturer's projection of 90 ppm CO outlet concentration in the burner exhaust. At the design firing rate of 100 MM Btu/hr, this works out to 0.09 lb/MM Btu.

Again, because of the inverse relationship between NO_x and CO emissions, carbon monoxide emissions will be somewhat higher from the AQD #85 boiler stack with its "Low NO_x " burner performance, than they would be from a conventional burner. As noted above, nitrogen oxides are the more critical of the two pollutants from the human health and welfare perspective, thus the Division is again satisfied that the

predicted CO performance of the proposed AQD #85 "Low NO_x" burner acceptably satisfies BACT for CO.

Control Equipment Specifications

Because the details of the control equipment specifications have not been provided in the application, final review of the effectiveness of these controls is limited. The Division will set allowable emission limits for pollutants based on design emission parameters provided by Solvay. However, as a BACT permit condition, the Division will require Solvay to provide the plans and specifications of each of these control devices for final approval, prior to installation.

PREVENTION OF SIGNIFICANT DETERIORATION (PSD):

Table I of this analysis shows the particulate, sulfur dioxide, nitrogen oxide and volatile organic emissions from the existing equipment at the Solvay trona plant, along with the proposed emissions from the "D" train expansion. As can be seen, the existing Solvay plant is a "major emitting facility" under paragraph 24(a)(I)(b) of the Wyoming Air Quality Standards & Regulations because it has the potential to emit more than 250 TPY of regulated pollutants (482 TPY of TSP, 618 TPY of SO₂, 2,369 TPY of NO_x and 4,639 TPY of VOC's).

If an operator undertakes a "major modification" of a "major emitting facility", then PSD regulations are applicable. Paragraph 24(a)(x) of the regulations defines a "major modification" as any change which results in a "significant net emissions increase". Paragraph 24(a)(xii) allows for a "contemporaneous decrease in actual emissions" to offset increases used for calculating a "significant net emissions increase". Paragraph 24(a)(xix) of the regulations requires the Division to use a representative two-year period preceding the emissions change to determine "actual emissions" of an emission source.

◆ PSD Particulate Accounting ◆

Permit changes occurring after the 1977 effective date of the PSD regulations at the Solvay plant include the following permits and waivers:

| <u>Permit Number</u> | <u>Date Issued</u> | <u>Project Description</u> |
|----------------------|--------------------|--|
| CT-234 | Jul '79 | initial construction of a 1 MM TPY soda ash plant |
| CT-234A | Dec '81 | AQD #16 stack parameter modifications |
| CT-234A2 (OP-154) | Sep '84 | address as-built modifications to 1 MM TPY plant |
| CT-643 | Sep '85 | initial design for construction of the Alkaten plant |
| CT-643A (OP-181) | Jul '86 | revised plans for construction of the Alkaten plant |
| MD-117 (OP-257) | Feb '90 | caustic/sodium sulfite facility & DR-4 fluid bed drier |
| MD-132 (OP-258) | Nov '90 | "C" soda ash product line → 2 MM TPY plant capacity |
| T-200 Waiver | Feb '92 | construct T-200 Alkaten storage bin & AQD #54 baghouse |
| CT-946 | Mar '92 | calcined trona project (project was mostly abandoned) |
| MD-229 | Jun '95 | conversion of "A" & "B" trona calciners to gas firing |
| MD-282 | May '96 | construction of a meta-bisulfite production facility |

Because this plant was not constructed until 1982, after the 1977 effective date of the PSD regulations, all of the emissions from the facility consume PSD increment.

The MD-282 permit analysis provides an update of the PSD particulate status for the Solvay Green River plant, showing 481.51 TPY of particulate emissions permitted from the plant. A total of 480.53 TPY had been considered in the most recent previous PSD

Increment consumption analysis, therefore at that time, 0.98 TPY remained toward the "net emissions increase" calculation for PSD particulate increment consumption at the Solvay plant.

As noted, under this project Solvay is proposing to retire ore reclaim baghouse AQD #2b, sulfite product bagging baghouse AQD #40, and crusher building baghouse AQD #47 from service; eliminating the particulate allowable limits for these sources from the plant emission inventory. They also will abandon plans for the MD-282 permitted AQD #69 soda ash bagging silo bin vent, but no credit accrues under PSD regulations for the AQD #69 action because this source was never constructed, thus actual emissions over the last two years were zero.

As further particulate emission reduction, Solvay is proposing to reduce plant allowable particulate emissions from existing source AQD #'s 6b, 10, 11, 14, 41, 44, 46, 64 and 65 by basing emission loadings on 0.01 gr/dscf predicted emissions, rather than on 0.02 gr/dscf as had been considered for these units in past permits. The AQD #15 soda ash dryer stack and the AQD #73 meta-bisulfite dryer stack will take a slightly lower reduction, down to 0.015 gr/dscf. They also planned to reduce plant allowable particulate emissions from five other existing plant sources based on internal testing showing lower actual emissions than the former allowable emission limits. The allowables for the two coal boilers (AQD #18 & 19), the AQD #26 Alkaten dryer, the AQD #50 "C" train dryer area housekeeping baghouse, and the AQD #51 silo reclaim baghouse will all be set under 0.006 gr/dscf, while the testing on the "C" train AQD #51 gas fired dryer showed that an emission rate of 0.008 gr/dscf is most appropriate.

In this application, Solvay is also proposing to reduce plant allowable particulate emissions from four sources permitted under the latest permit, MD-282, but not yet constructed. These sources are AQD #'s 68, 70, 71 and 72, and the reductions would again be accomplished by basing emission loadings on 0.01 gr/dscf predicted emissions, rather than on 0.02 gr/dscf. As with AQD #69, no credit accrues under PSD regulations for this action because these baghouses were never constructed, thus actual emissions over the last two years were zero.

The accounting of the particulate PSD credit due Solvay is shown in Table C.

| Table C: Solvay Actual Particulate Emissions Offset Credit | | | | | |
|--|-----------------|-----------|----------------|-----------------|------------|
| Emission Sources | Operating Hours | | | Emission Credit | |
| | Affected Years | Hours | 2 Year Average | actual pph | actual TPY |
| AQD #2b | 1995-96 | 8406/8639 | 8523 | 0.06 | 0.26 |
| AQD #6b | 1995-96 | 3120/7464 | 5282 | 0.49 | 1.30 |
| AQD #10 | 1995-96 | 1535/1149 | 1342 | 0.28 | 0.19 |
| AQD #11 | 1995-96 | 1535/1149 | 1342 | 0.28 | 0.19 |
| AQD #14 | 1995-96 | 1145/1149 | 1147 | 0.46 | 0.26 |
| AQD #15 | 1995-96 | 8359/8712 | 8536 | 3.52 | 15.02 |
| AQD #18 | 1995-96 | 8548/8666 | 8607 | 11.12 | 47.85 |
| AQD #19 | 1995-96 | 8611/8650 | 8631 | 9.41 | 40.61 |
| AQD #26 | 1995-96 | 8280/8184 | 8232 | 0.76 | 3.13 |
| AQD #40 | 1995-96 | 3120/2098 | 2609 | 0.30 | 0.39 |
| AQD #41 | 1995-96 | 256/308 | 282 | 0.40 | 0.06 |
| AQD #44 | 1995-96 | 1649/ 822 | 1236 | 0.90 | 0.56 |
| AQD #46 | 1995-96 | 8161/8060 | 8111 | 1.20 | 4.87 |
| AQD #47 | 1995-96 | 8161/8060 | 8111 | 2.70 | 10.95 |
| AQD #50 | 1995-96 | 8280/8193 | 8237 | 0.49 | 2.02 |
| AQD #51 | 1995-96 | 8280/8193 | 8237 | 0.30 | 1.24 |
| AQD #53 | 1995-96 | 3120/7464 | 5292 | 1.10 | 2.91 |
| AQD #64 | 1995-96 | 3120/1350 | 2235 | 0.15 | 0.17 |
| AQD #65 | 1995-96 | 3120/1350 | 2235 | 0.06 | 0.07 |
| AQD #68 | 1995-96 | -0- / -0- | -0- | 0.41 | 0.00 |
| AQD #70 | 1995-96 | -0- / -0- | -0- | 0.41 | 0.00 |
| AQD #71 | 1995-96 | -0- / -0- | -0- | 0.41 | 0.00 |
| AQD #72 | 1995-96 | -0- / -0- | -0- | 0.14 | 0.00 |
| AQD #73 | 1995-96 | -0- / -0- | -0- | 0.14 | 0.00 |

Under PSD regulations, Solvay can receive PSD credit for reducing "actual" particulate emissions at the plant. As shown in Table D however, for several of the of these stacks (6b, 10, 11, 14, 15, 41, 50, 51, 64 & 65), the revised allowable

particulate emission rate is higher than the average actual emissions for the previous two years. Accordingly, no credit can be given under PSD regulations for the particulate matter emission change on these stacks, because there is no decrease in "actual emissions".

Table D: Solvay Particulate Emissions Changes; No PSD Credit Available (TPY)

| Source | Average Actual Emissions | | Permitted Emission | | Net Change | |
|--|--------------------------|-------------|--------------------|---------------|------------|--------|
| | 2 Year Avg | Record Year | Existing | Modified | Permitted | Actual |
| AQD #6b | 1.30 | '95-96 | 6.13 | 2.23 | -3.90 | 0.93 |
| AQD #10 | 0.19 | '95-96 | 2.63 | 0.57 α | -2.06 | 0.38 |
| AQD #11 | 0.19 | '95-96 | 2.63 | 0.46 α | -2.17 | 0.27 |
| AQD #14 | 0.26 | '95-96 | 4.38 | 0.81 α | -3.57 | 0.55 |
| AQD #15 | 15.02 | '95-96 | 29.78 | 19.01 | -10.77 | 3.99 |
| AQD #41 | 0.06 | '95-96 | 1.75 | 0.83 | -0.92 | 0.77 |
| AQD #50 | 2.02 | '95-96 | 9.20 | 3.07 | -6.13 | 1.05 |
| AQD #51 | 1.24 | '95-96 | 21.02 | 10.51 | -10.51 | 9.27 |
| AQD #64 | 0.17 | '95-96 | 0.66 | 0.35 | -0.31 | 0.18 |
| AQD #65 | 0.07 | '95-96 | 0.26 | 0.13 | -0.13 | 0.06 |
| α = Sources will operate on a schedule of 12 hours/day, therefore annual emissions are based on one half of a year, or 4380 hours operation | | | | | | |

With this accounting, the net particulate PSD change for Solvay additions to the plant from all applicable permits is shown in Table E. As can be seen the "contemporaneous decreases in actual emissions" do not offset the increases in PSD increment consuming sources proposed at the Solvay Plant, resulting in a net emissions increase of 31.33 TPY for PSD purposes on this "D" Train expansion project.

Table E: Solvay PSD Net Emissions Changes (Particulate TPY)

| Source | Average Actual Emissions | | Permitted Emission | | Net Change | |
|--|--------------------------|-------------|--------------------|---------------|------------|--------|
| | 2 Year Avg | Record Year | Existing | Modified | Permitted | Actual |
| Contemporaneous Decreases | | | | | | |
| AQD #2b | 0.26 | '95-96 | 0.88 | 0.00 | -0.88 | -0.26 |
| AQD #18 | 47.85 | '95-96 | 74.46 | 21.90 | -52.56 | -25.95 |
| AQD #19 | 40.61 | '95-96 | 74.46 | 21.90 | -52.56 | -18.71 |
| AQD #26 | 3.13 | '95-96 | 4.82 | 2.41 | -2.41 | -0.72 |
| AQD #40 | 0.39 | '95-96 | 1.31 | 0.00 | -1.31 | -0.39 |
| AQD #44 | 0.56 | '95-96 | 3.94 | 0.39 α | -3.55 | -0.17 |
| AQD #46 | 4.87 | '95-96 | 5.26 | 3.11 | -2.15 | -1.76 |
| AQD #47 | 10.95 | '95-96 | 22.34 | 0.00 | -22.34 | -10.95 |
| Total Decreases | 108.62 | n.a. | 187.47 | 49.71 | -137.76 | -58.91 |
| PSD Increases | | | | | | |
| "D" Train Expansion | 0.00 | n.a. | 0.00 | 89.26 | 89.26 | 89.26 |
| Total Increases | 0.00 | n.a. | 0.00 | 89.26 | 89.26 | 89.26 |
| Subtotal, Increment Consuming Emissions This Project | | | | | -48.50 | 30.35 |
| Total Increment Consuming Emissions Considered in Last Analysis (MD-282) | | | | | | 481.51 |
| Subtotal Solvay Increment Consuming Emissions | | | | | | 511.86 |
| Subtract Emissions Considered in Previous Increment Analysis (CT-946) | | | | | | 480.53 |
| Net Particulate Emissions Change (since last PSD Analysis) | | | | | | 31.33 |
| α = Sources will operate on a schedule of 12 hours/day, therefore annual emissions are based on one half of a year, or 4380 hours operation | | | | | | |

As can be seen, the "net emissions increase" for this project, per PSD rules, is 31.33 TPY, based on the actual emissions reductions compared to the potential emission increases. However, with the reduction in allowable emissions established under this proposed permit, the total allowable particulate emissions from the Solvay Plant are 384.8 TPY, down from the 481.5 TPY previously permitted, as shown in Table I of this analysis. All of the 384.8 TPY of particulate emission consume PSD increment.

◆ PSD Nitrogen Oxide Accounting ◆

Permit changes occurring after the 1977 effective date of the PSD regulations at the Solvay plant include the following permits and waivers:

| Permit Number | Date Issued | Project Description |
|-------------------|-------------|--|
| CT-234 | Jul '79 | initial construction of a 1 MM TPY soda ash plant |
| CT-234A | Dec '81 | AQD #16 stack parameter modifications |
| CT-234A2 (OP-154) | Sep '84 | address as-built modifications to 1 MM TPY plant |
| CT-643 | Sep '85 | initial design for construction of the Alkaten plant |
| CT-643A (OP-181) | Jul '86 | revised plans for construction of the Alkaten plant |
| MD-117 (OP-257) | Feb '90 | caustic/sodium sulfite facility & DR-4 fluid bed drier |
| MD-132 (OP-258) | Nov '90 | "C" soda ash product line → 2 MM TPY plant capacity |
| T-200 Waiver | Feb '92 | construct T-200 Alkaten storage bin & AQD #54 baghouse |
| CT-946 | Mar '92 | calcined trona project (project was mostly abandoned) |
| MD-229 | Jun '95 | conversion of "A" & "B" trona calciners to gas firing |
| MD-282 | May '96 | construction of a meta-bisulfite production facility |

The NO_x increments were not effective until February '88 (increments established 2/8/88; minor source baseline date for Wyoming triggered 2/26/88), therefore under PSD regulation, emissions from MD-117 and subsequent permits, are the only emissions counted when assessing NO_x increment consumption.

NO_x emission sources constructed after the 1988 NO_x baseline date include the AQD #33 sulfite sulfur burner (1.50 pph), the AQD #48 "C" ore calciner (10.00 pph), the AQD #51 DR-5 soda ash dryer (18.00 pph), the AQD #73 MBS product dryer (0.15 pph), and twin 6 MM Btu/hr supplemental heat duct burners in the inlet ducts of the "A" & "B" line steam tube dryers which exhaust to the AQD #15 stack (1.20 pph). Totaling these emissions results in 30.85 pph, or 135.12 TPY NO_x increment consumption.

Solvay did accumulate a credit for converting their "A" & "B" calciners to gas under MD-229 in 1995, the Division has determined that they did not "use" that credit at that time because the new sources constructed under that project did not result in a "significant" increase, thus the project was not subject to PSD regulations. Under MD-292, the company elected not to "use" the NO_x credit to offset sources constructed for the MBS plant. The term for "contemporaneous" use of a decrease is defined by Section 24(a)(xii)(B) as five years from the date that actual emissions were reduced. As the "A" & "B" calciner gas conversion was completed and operation began in October '95, while Solvay's current application was received in June '97, they are within the regulatory time frame to use that emission credit.

The accounting of the NO_x PSD credit due Solvay is shown in Table F.

| Table F: Solvay Actual NO _x Emissions Offset Credit | | | | | |
|--|-----------------|-----------|----------------|-----------------|------------|
| Emission Sources | Operating Hours | | | Emission Credit | |
| | Affected Years | Hours | 2 Year Average | actual pph | actual TPY |
| Nitrogen Oxides | | | | | |
| AOD #17 gas conversion | 1993-94 | 8430/8575 | 8503 | 161.00 | 684.49 |

As noted previously, under this permit, Solvay intends to increase the trona ore throughput and adjust the predicted burner NO_x emission performance up to 0.06 lb/MM Btu, based on test results on the calciners exhausting to AQD #17 and AQD #48 stacks. AQD #17 will increase allowable NO_x emissions by 10.00 pph, while AQD #48 will increase allowable NO_x by another 5.00 pph, for a total increase of 15.00 pph, or 65.70 TPY. Actual emissions for the two sources for the most recent two years of available data are: 66.18 TPY for AQD #17 (15.53 @ 8523 average hours operation 1995-1996), and 31.31 TPY for AQD #48 (7.72 @ 8111 average hours operation 1995-1996).

New sources proposed for the "D" calciner train (AQD #80 calciner, AQD #82 dryer, AQD #85 gas boiler) add another 53.80 pph, or 235.64 TPY NO_x.

With this accounting, the net NO_x PSD change for Solvay additions to the plant from all applicable permits is shown in Table G. As can be seen the "contemporaneous decreases in actual emissions" completely offset the increases in PSD increment consuming sources proposed at the Solvay Plant, resulting in a net emissions decrease of 126.52 TPY for PSD purposes on this "D" Train expansion project.

| Table G: Solvay PSD Net Emissions Changes (Nitrogen Oxides TPY) | | | | | | |
|---|--------------------------|-------------|--------------------|----------|------------|---------|
| Source | Average Actual Emissions | | Permitted Emission | | Net Change | |
| | 2 Year Avg | Record Year | Existing | Modified | Permitted | Actual |
| Contemporaneous Decreases | | | | | | |
| AQD #17 gas conversion | 684.49 | '93-94 | 1314.00 | 87.60 | -1226.40 | -596.89 |
| Total Decreases | 684.49 | n.a. | 1314.00 | 87.60 | -1226.40 | -596.89 |
| PSD Increases | | | | | | |
| AQD #17 TPH/burner adj | 66.18 | '95-96 | 87.60 | 131.40 | 43.80 | 65.22 |
| AQD #48 TPH/burner adj | 31.31 | '95-96 | 43.80 | 65.70 | 21.90 | 34.39 |
| "D" Train Expansion | n.a. | n.a. | 0.00 | 235.64 | 235.64 | 235.64 |
| Total Increases | 97.49 | n.a. | 131.40 | 432.74 | 301.34 | 335.25 |
| Subtotal, Increment Consuming Emissions This Project | | | | | -925.06 | -261.64 |
| Total Increment Consuming Emissions Considered in Last Analysis (current) | | | | | | 135.12 |
| Subtotal Solvay Increment Consuming Emissions | | | | | | -126.52 |
| Subtract Emissions Considered in Previous Increment Analysis | | | | | | 0.00 |
| Net Nitrogen Oxides Emissions Change (since last PSD Analysis) | | | | | | -126.52 |

As can be seen, there were 135.12 TPY of NO_x emission consuming emissions at the plant previously, therefore with the current reduction, the total PSD NO_x consuming emissions at Solvay now total to -126.52 TPY. These emission represent the total PSD NO_x increment consumption at the Solvay plant to date.

Section 24(a)(xii)(C) of the Wyoming Air Quality Standards & Regulations, limits the use of a "contemporaneous net emission decrease" to only one application. Therefore the "excess" NO_x credit of -126.52 TPY NO_x, cannot be used again in future application to offset any other projects which have NO_x increases

◆ PSD VOC Accounting ◆

Permit changes occurring after the 1977 effective date of the PSD regulations at the Solvay plant include the following permits and waivers:

| <u>Permit Number</u> | <u>Date Issued</u> | <u>Project Description</u> |
|----------------------|--------------------|--|
| CT-234 | Jul '79 | initial construction of a 1 MM TPY soda ash plant |
| CT-234A | Dec '81 | AQD #16 stack parameter modifications |
| CT-234A2 (OP-154) | Sep '84 | address as-built modifications to 1 MM TPY plant |
| CT-643 | Sep '85 | initial design for construction of the Alkaten plant |
| CT-643A (OP-181) | Jul '86 | revised plans for construction of the Alkaten plant |
| MD-117 (OP-257) | Feb '90 | caustic/sodium sulfite facility & DR-4 fluid bed drier |
| MD-132 (OP-258) | Nov '90 | "C" soda ash product line → 2 MM TPY plant capacity |
| T-200 Waiver | Feb '92 | construct T-200 Alkaten storage bin & AQD #54 baghouse |
| CT-946 | Mar '92 | calcined trona project (project was mostly abandoned) |
| MD-229 | Jun '95 | conversion of "A" & "B" trona calciners to gas firing |
| MD-282 | May '96 | construction of a meta-bisulfite production facility |

Because this plant was not constructed until 1982, after the 1977 effective date of the PSD regulations, all of the emissions from the facility consume PSD increment.

The MD-282 permit analysis provides an update of the PSD status for the Solvay Green River plant, showing the list of sources that were in place after that project. Although VOC emission totals were not shown in that analysis, a review based on currently defined VOC emission rates of that source list shows that there were 4639.30 TPY of VOC emissions permitted from the plant. VOC emissions had not been considered in the past PSD increment consumption analyses, therefore at that time, all plant emissions count toward the "net emissions increase" calculation for PSD VOC increment consumption at the Solvay plant.

As noted, under this project Solvay is proposing to retire ore reclaim baghouse AQD #2b and sulfite product bagging baghouse AQD #40 from service; and will also abandon plans for the MD-282 permitted AQD #69 soda ash bagging silo bin vent. These emission sources have no VOC emissions, therefore there is no credit due for their elimination.

As noted previously, under this permit Solvay intends to increase the trona ore throughput on the calciners exhausting to AQD #17 and AQD #48 stacks. VOC emissions are a function of throughput, figured at 1.94 pounds per ton of throughput on these two stacks. Thus AQD #17 will increase VOC emissions by 147.44 pph (162 TPH ore throughput, increased to 200 TPH on both "A" & "B" calciner), while AQD #48 will increase VOC emissions by 73.72 pph (162 TPH ore throughput, increased to 200 TPH on "C" calciner), for a total increase of 221.16 pph, or 968.68 TPY. Actual emissions for the two sources for the past two years are 2,678.61 TPY for AQD #17 (628.56 pph @ 8523 average hours operation 1995-1996), and 1,274.56 TPY for AQD #48 (314.28 pph @ 8111 average hours operation 1995-1996).

New equipment installed under this permit adds a total of 2,239.10 TPY of VOC.

With this accounting, the net VOC PSD change for Solvay additions to the plant from all applicable permits is shown in Table H. As can be seen there is no "contemporaneous decreases in actual emissions" to offset the increases in PSD increment consuming sources proposed at the Solvay Plant, resulting in a net emissions increase of 8123.55 TPY for PSD purposes on this "D" Train expansion project.

Table H: Solvay PSD Net Emissions Changes (Volatile Organic Compounds TPY)

| Source | Average Actual Emissions | | Permitted Emission | | Net Change | |
|---|--------------------------|-------------|--------------------|----------|------------|---------|
| | 2 Year Avg | Record Year | Existing | Modified | Permitted | Actual |
| Contemporaneous Decreases | | | | | | |
| no available decreases | 0.00 | n.a. | 0.00 | 0.00 | 0.00 | 0.00 |
| Total Decreases | 0.00 | n.a. | 0.00 | 0.00 | 0.00 | 0.00 |
| PSD Increases | | | | | | |
| AQD #17 → 400 TPH | 2678.61 | '95-96 | 2753.09 | 3398.88 | 645.79 | 720.27 |
| AQD #48 → 200 TPH | 1274.56 | '95-96 | 1376.55 | 1699.44 | 322.89 | 424.88 |
| "D" Train Expansion | n.a. | n.a. | 0.00 | 2339.10 | 2339.10 | 2339.10 |
| Total Increases | 3953.17 | n.a. | 4129.64 | 7437.42 | 3307.78 | 3484.25 |
| Subtotal, Increment Consuming Emissions This Project | | | | | 3307.78 | 3484.25 |
| Total Increment Consuming Emissions Considered in Last Analysis (current) | | | | | | 4639.30 |
| Subtotal Solvay Increment Consuming Emissions | | | | | | 8123.55 |
| Subtract Emissions Considered in Previous Increment Analysis | | | | | | 0.00 |
| Net Volatile Organic Compound Emissions Change (since last PSD Analysis) | | | | | | 8123.55 |

As can be seen, there were 4639.30 TPY of VOC emission consuming emissions at the plant previously, therefore for the purpose of calculating the "net emissions increase" for this project, PSD VOC emissions at Solvay are now 8123.55 TPY for comparison against the Section 24(a)(xxi)(A) significance threshold. The current 7947.10 TPY plant VOC emission total represents the full applicable PSD VOC emission consumption at the Solvay plant to date.

◆ PSD CO Accounting ◆

Permit changes occurring after the 1977 effective date of the PSD regulations at the Solvay plant include the following permits and waivers:

| Permit Number | Date Issued | Project Description |
|-------------------|-------------|--|
| CT-234 | Jul '79 | initial construction of a 1 MM TPY soda ash plant |
| CT-234A | Dec '81 | AQD #16 stack parameter modifications |
| CT-234A2 (OP-154) | Sep '84 | address as-built modifications to 1 MM TPY plant |
| CT-643 | Sep '85 | initial design for construction of the Alkaten plant |
| CT-643A (OP-181) | Jul '86 | revised plans for construction of the Alkaten plant |
| MD-117 (OP-257) | Feb '90 | caustic/sodium sulfite facility & DR-4 fluid bed drier |

| | | |
|-----------------|---------|--|
| MD-132 (OP-258) | Nov '90 | "C" soda ash product line → 2 MM TPY plant capacity |
| T-200 Waiver | Feb '92 | construct T-200 Alkaten storage bin & AQD #54 baghouse |
| CT-946 | Mar '92 | calcined trona project (project was mostly abandoned) |
| MD-229 | Jun '95 | conversion of "A" & "B" trona calciners to gas firing |
| MD-282 | May '96 | construction of a meta-bisulfite production facility |

Because this plant was not constructed until 1982, after the 1977 effective date of the PSD regulations, all of the emissions from the facility consume PSD increment.

The MD-282 permit analysis provides an update of the PSD status for the Solvay Green River plant, showing the list of sources that were in place after that project. Although CO emission totals were not shown in that analysis, a review based on currently defined CO emission rates of that source list shows that there were 1896.69 TPY of CO emissions permitted from the plant. CO emissions had not been considered in the past PSD increment consumption analyses, therefore at that time, all plant emissions count toward the "net emissions increase" calculation for PSD CO increment consumption at the Solvay plant.

As noted, under this project Solvay is proposing to retire ore reclaim baghouse AQD #2b and sulfite product bagging baghouse AQD #40 from service; and will also abandon plans for the MD-282 permitted AQD #69 soda ash bagging silo bin vent. These emission sources have no CO emissions, therefore there is no credit due for their elimination.

As noted previously, under this permit Solvay intends to increase the trona ore throughput and on the calciners exhausting to AQD #17 and AQD #48 stacks. CO emissions are a function of throughput, figured at 3.81 pounds per ton of throughput on these two stacks. Thus AQD #17 will increase CO emissions by 289.56 pph (162 TPH ore throughput, increased to 200 TPH on both "A" & "B" calciner), while AQD #48 will increase CO emissions by 144.78 pph (162 TPH ore throughput, increased to 200 TPH on "C" calciner), for a total increase of 434.34 pph, or 1902.41 TPY. Actual emissions for the two sources for the past two years are 5,260.57 TPY for AQD #17 (1,234.44 pph @ 8523 average hours operation 1995-1996), and 2,503.14 TPY for AQD #48 (617.22 pph @ 8111 average hours operation 1995-1996).

New equipment installed under this permit adds a total of 4,689.89 TPY of CO.

With this accounting, the net CO PSD change for Solvay additions to the plant from all applicable permits is shown in Table J. As can be seen there is no "contemporaneous decreases in actual emissions" to offset the increases in PSD increment consuming sources proposed at the Solvay Plant, resulting in a net emissions increase of 15,229.6 TPY for PSD purposes on this "D" Train expansion project.

| Table J: Solvay PSD Net Emissions Changes (Carbon Monoxide TPY) | | | | | | |
|---|--------------------------|-------------|--------------------|----------|------------|----------|
| Source | Average Actual Emissions | | Permitted Emission | | Net Change | |
| | 2 Year Avg | Record Year | Existing | Modified | Permitted | Actual |
| Contemporaneous Decreases | | | | | | |
| no available decreases | 0.00 | n.a. | 0.00 | 0.00 | 0.00 | 0.00 |
| Total Decreases | 0.00 | n.a. | 0.00 | 0.00 | 0.00 | 0.00 |
| PSD Increases | | | | | | |
| AQD #17 → 400 TPH | 5260.57 | '95-96 | 5406.85 | 6675.12 | 1268.27 | 1414.55 |
| AQD #48 → 200 TPH | 2503.14 | '95-96 | 2703.42 | 3337.56 | 634.14 | 834.42 |
| "D" Train Expansion | n.a. | n.a. | 0.00 | 4689.89 | 4689.89 | 4689.89 |
| Total Increases | 7763.71 | n.a. | 8110.27 | 14702.57 | 6592.30 | 6938.86 |
| Subtotal, Increment Consuming Emissions This Project | | | | | 6592.30 | 6938.86 |
| Total Increment Consuming Emissions Considered in Last Analysis (current) | | | | | | 8290.81 |
| Subtotal Solvay Increment Consuming Emissions | | | | | | 15229.67 |
| Subtract Emissions Considered in Previous Increment Analysis | | | | | | 0.00 |
| Net Particulate Emissions Change (since last PSD Analysis) | | | | | | 15229.67 |

As can be seen, there were 8,290.81 TPY of CO emission consuming emissions at the plant previously, therefore for the purpose of calculating the "net emissions increase" for this project, PSD CO emissions at Solvay are now 15,229.67 TPY for comparison against the Section 24(a)(xxi)(A) significance threshold. The current 14,883.11 TPY plant CO emission total represents the full applicable PSD CO emission consumption at the Solvay plant to date.

◆ PSD Summary ◆

The following table shows the projected emission changes for the new Unit 6 plant equipment as compared with the "significance levels" contained in Section 24 (a)(xxi)(A) of the Wyoming Air Quality Standards & Regulations.

Table of Significance for PSD Applicability
Solvay "D" Train Plant Emissions (TPY)

| Pollutant | Projected Emission Increase | Significant Emission Rate | Significant? |
|------------------|-----------------------------|---------------------------|--------------|
| TSP | 31 | 25 | Yes |
| PM ₁₀ | 31 | 15 | Yes |
| NO _x | -127 | 40 | No |
| VOC | 3308 | 40 | Yes |
| CO | 6592 | 100 | Yes |

As can be seen, the "D" Train plant expansion project will not result in a significant net emissions increase for nitrogen oxides, but the project is significant for particulate, carbon monoxide and volatile organic compounds. Therefore this is not a "major modification" of a major emitting facility for NO_x, and increment consumption analysis is not required.

PROJECTED IMPACT ON EXISTING AMBIENT AIR QUALITY:

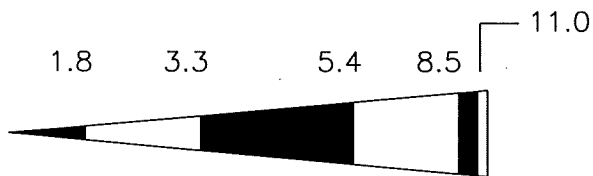
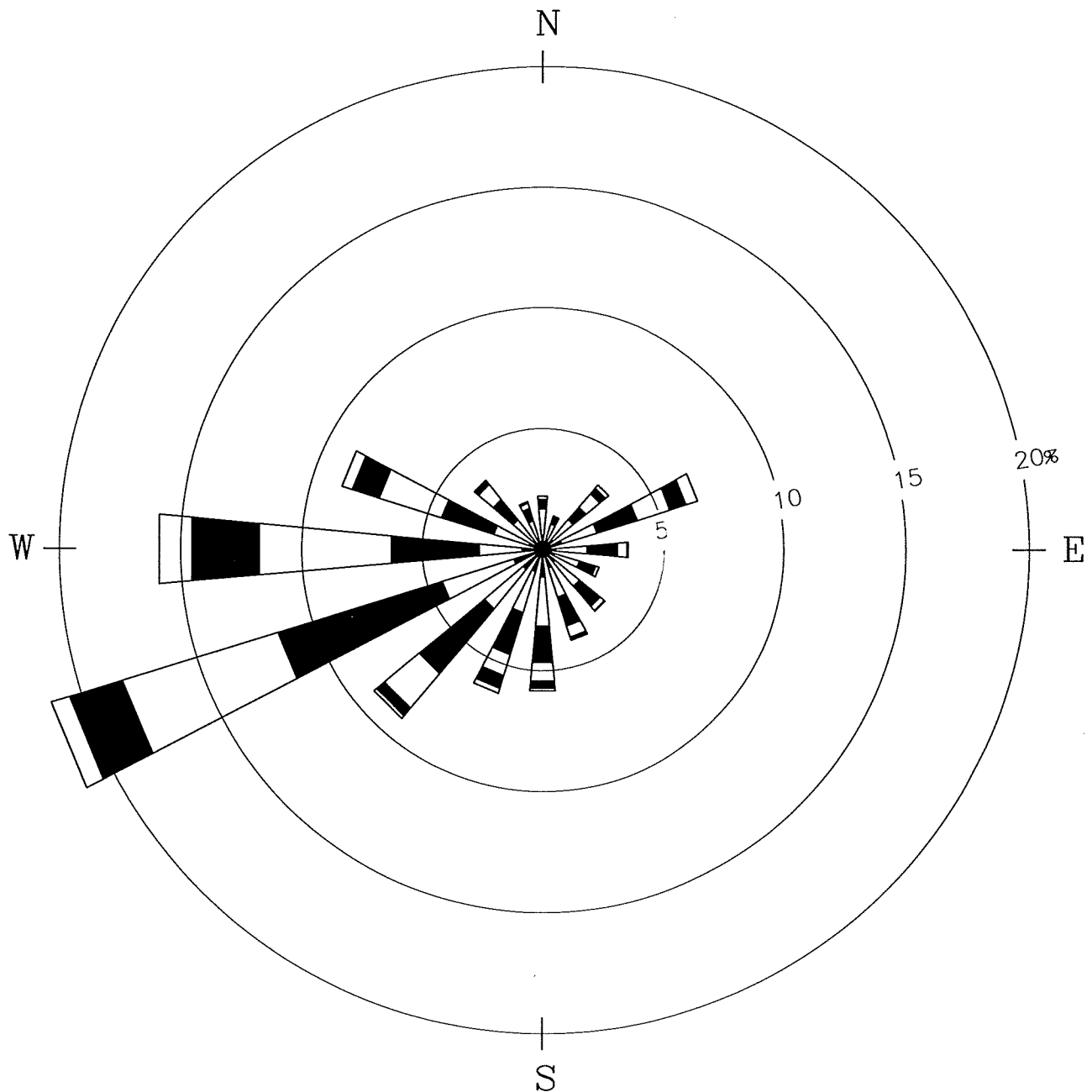
Model Justification: The applicant used the Industrial Source Complex 3 Short Term 3 (ISCST3) model, version 96113 for evaluating concentrations of PM₁₀, NO_x, CO and SO₂. The models were run with recommended regulatory defaults. Options used were rural dispersion coefficients with no exponential decay, final plume rise, stack tip downwash, buoyancy-induced dispersion, and calms processing. In addition, the applicant used Trinity Consultant's version of EPA's Building Profile Input Program to determine downwash parameters to include in the model runs. Terrain at or near the Solvay facility is slightly rolling with some terrain exceeding stack top elevation, and can be characterized as complex terrain. EPA has specified that the model of choice for complex terrain in an industrial setting with multiple sources is ISC3.

Meteorological Data: All modeling was performed using five (5) years of National Weather Service hourly surface meteorological data collected at the Rock Springs airport (Station #24027) for the calendar years of 1987 to 1991. Twice-daily upper air soundings collected at the Lander airport (Station #24021) were processed for the same time period and merged with the hourly data. A wind rose which represents an average of the surface wind patterns during 1984, 1985, 1987, 1988 and 1989, is portrayed as a five year averaged joint frequency distribution and is shown in Figure 1. An average of the wind statistics for this data set indicates the predominant winds originate from the west-southwest direction approximately 21% of the time.

Background Concentrations: The NO₂ and CO background values are those used in Air Quality Permit CT-1148 for Wold Trona (1994). A background NO₂ concentration of 3.0 µg/m³ was measured in 1983 at the Chevron Phosphate plant located 4.5 miles southeast of Rock Springs, Wyoming. Background concentrations for CO were obtained from monitored data collected by the Division and commercial operators (BLM, 1983). Ambient PM₁₀ concentrations from Solvay's upwind PM₁₀ monitor were evaluated for 1994-1996. The highest 24-hour average monitored PM₁₀ value from 1995 was 57.0 µg/m³, and the maximum annual averaged PM₁₀ value from 1994 was 11.25 µg/m³. All background concentrations are listed in Table 1.

Table 1. Background Concentrations Used in Solvay Minerals Analysis

| Pollutant | Averaging Period | Background Concentration |
|------------------|------------------|--------------------------|
| NO ₂ | Annual | 3.0 µg/m ³ |
| CO | 1-Hour | 3,500 µg/m ³ |
| CO | 8-Hour | 1,500 µg/m ³ |
| PM ₁₀ | 24-Hour | 57.0 µg/m ³ |
| PM ₁₀ | Annual | 11.25 µg/m ³ |



WIND SPEED CLASS BOUNDARIES
(METERS/SECOND)

NOTES:
 DIAGRAM OF THE FREQUENCY OF
 OCCURRENCE OF EACH WIND DIRECTION.
 WIND DIRECTION IS THE DIRECTION
 FROM WHICH THE WIND IS BLOWING.
 EXAMPLE - WIND IS BLOWING FROM THE
 NORTH 2.2 PERCENT OF THE TIME.

FIGURE 1 WINDROSE

RKSLND5Y.STR
 NWS RKS/LND DATA SET
 5YR JOINT FREQUENCY
 ROCK SPRINGS AIRPORT
 PERIOD: 1984-1989

BEE-LINE
SOLVAY2016_1.4_001153

Emissions and Stack Parameters: Emission rates for the sources at Solvay Minerals are listed in Table 2a, and the corresponding stack parameters are listed in Table 2b. Changes in the design of the proposed expansion sources resulted in revisions to the original PM_{10} emission rates, and sources 47,74,75,77,78 and 84 were removed. Additionally, PM_{10} emission rates for four previously permitted sources (10, 11, 14 and 44) were also reduced; the allowable PM_{10} emission rates for these sources will be based on a 12 hour/day operating schedule. Allowable emission rates for all other sources were calculated based on an operational schedule of 8760 hrs/yr.

Receptor Grid: The NAAQS and PSD Class II modeling analyses were conducted using the receptor configuration shown in Figure 2. Receptor locations used in other analyses are described in the associated text. A 500-meter coarse receptor grid was generated using a 21x21 matrix; this grid encompassed an area approximately 3 kilometers in each direction of the Solvay facility. The southwest corner of the 500-meter coarse grid was located at UTM coordinate (599000,4590000).

A fine receptor grid was superimposed on the 500-meter grid to improve the resolution of all regions where maximum concentrations were identified in the coarse grid, and consists of an 36x31 matrix with 100-meter spacing. The southwest corner of the 100-meter fine grid was located at UTM coordinate (602000,4593500). Ninety-seven (97) discrete Cartesian receptors were also placed along the plant works boundary at 100-meter intervals.

The initial modeling indicated that maximum short-term (24-hour) impacts were occurring at a ridge approximately 700 meters southwest of the Solvay Minerals facility. Therefore, twenty-six (26) additional discrete Cartesian receptors were placed along this southwest ridge at 25-meter intervals for improved resolution in predicting 24-hour PM_{10} impacts.

Terrain elevations for each receptor were interpolated from electronic data contained in USGS 7.5 minute Digital Elevation Model (DEM) files compiled from four (4) quadrangle maps: Little America, Bryan, Massacre Hill, and Antelope Knoll NE. The consultant used Trinity's BREEZE AIR SUITE software to interpolate elevations for each receptor using an inverse-distance interpolation method to compute elevations from the known elevation values of the four neighboring DEM data points. Elevation contours which describe the surrounding topography used in the modeling domain are shown in Figure 2a, a 3-dimensional depiction of the local topography and the receptors used in the modeling analyses are shown in Figure 2b.

National Ambient Air Quality Standards (NAAQS) Analysis:

◆ Nitrogen Oxides (NO_x) ◆

The increase in NO_x emissions as a result of the proposed expansion is 235.6 TPY, and the total facility emissions are now 2671.4 TPY. The applicant modeled the total NO_x emissions from Solvay Minerals to determine compliance with the annual NAAQS of $100 \mu g/m^3$. The maximum modeled annual NO_x concentration was $55.74 \mu g/m^3$. Supplement C to the Guideline on Air Quality Models allows the use of the ambient ratio method, which provides for a 25% reduction in modeled NO_x concentrations for purposes of estimating nitrogen dioxide (NO_2) concentrations. Multiplying the maximum annual NO_x concentration by 0.75 yields an annual NO_2 concentration of $41.81 \mu g/m^3$. The maximum predicted annual NO_2 concentration including the background value was $44.81 \mu g/m^3$. The modeling analysis shows compliance with the NAAQS for NO_2 at the corrected emission levels. Results of the NAAQS modeling for NO_2 are shown in Table 3. An isopleth plot of the annual NO_x impact is shown in Figure 3.

Table 2a. Emission Rates Used in Modeling Analysis for Solvay Minerals

| AQID# | Source ID | PM ₁₀ | | NO _x | | CO | | SO ₂ | | VOC | |
|-------|-----------------------|------------------|---------|-----------------|---------|--------|---------|-----------------|---------|-------|---------|
| | | (g/s) | (lb/hr) | (g/s) | (lb/hr) | (g/s) | (lb/hr) | (g/s) | (lb/hr) | (g/s) | (lb/hr) |
| 2A | Ore Crusher | 0.20 | 1.60 | | | | | | | | |
| 6A | Top Silos | 0.04 | 0.30 | | | | | | | | |
| 6B | Silo Reclaim | 0.06 | 0.51 | | | | | | | | |
| 7 | Product Loadout | 0.15 | 1.20 | | | | | | | | |
| 10 | Coal Crushing | 0.03 | 0.26 | | | | | | | | |
| 11 | Coal Transfer | 0.03 | 0.21 | | | | | | | | |
| 14 | Boiler Coal Bunker | 0.05 | 0.37 | | | | | | | | |
| 15 | Product Dryer 1&2 | 0.55 | 4.34 | 0.15 | 1.20 | | | | | | |
| 16 | Product Classifier | 0.11 | 0.90 | | | | | | | | |
| 17 | A&B Ore Calciners | 2.81 | 22.30 | 3.78 | 30.00 | 192.02 | 1524.00 | | | 97.78 | 776.00 |
| 18 | #1 Coal Boiler | 0.63 | 5.00 | 30.87 | 245.00 | 2.21 | 17.50 | 8.82 | 70.00 | 0.06 | 0.50 |
| 19 | #2 Coal Boiler | 0.63 | 5.00 | 30.87 | 245.00 | 2.21 | 17.50 | 8.82 | 70.00 | 0.06 | 0.50 |
| 24 | Boiler Flyash Silo | 0.04 | 0.30 | | | | | | | | |
| 25 | Alkaten Crushing | 0.13 | 1.00 | | | | | | | | |
| 26 | DR-3 Alkaten Dryer | 0.07 | 0.55 | 0.03 | 0.25 | 0.01 | 0.07 | | | | |
| 27 | Alkaten Bagging | 0.06 | 0.50 | | | | | | | | |
| 28 | DR-4 Product Dryer | 0.37 | 2.90 | | | | | | | | |
| 30 | Lime Bin #1 | 0.03 | 0.20 | | | | | | | | |
| 31 | Lime Bin #2 | 0.03 | 0.20 | | | | | | | | |
| 33 | Sulfur Burner | | | 0.19 | 1.50 | | | 0.05 | 0.40 | | |
| 35 | Sulfite Dryer | 0.18 | 1.40 | | | | | | | | |
| 36 | Sulfite Bin #1 | 0.01 | 0.10 | | | | | | | | |
| 37 | Sulfite Bin #2 | 0.01 | 0.10 | | | | | | | | |
| 38 | Sulfite Bin #3 | 0.01 | 0.10 | | | | | | | | |
| 39 | Sulfite Bin #4 | 0.01 | 0.10 | | | | | | | | |
| 41 | Sulfite Loadout | 0.02 | 0.19 | | | | | | | | |
| 44 | Lime Unloading | 0.02 | 0.18 | | | | | | | | |
| 45 | Alkaten Transloading | 0.03 | 0.20 | | | | | | | | |
| 46 | #2 Ore Transfer | 0.09 | 0.71 | | | | | | | | |
| 48 | "C" Ore Calciner | 1.17 | 9.30 | 1.89 | 15.00 | 96.01 | 762.00 | | | 48.89 | 388 |
| 50 | "C" Train Dryer | 0.09 | 0.70 | | | | | | | | |
| 51 | DR-5 Product Dryer | 0.30 | 2.40 | 2.27 | 18.00 | 0.30 | 2.40 | | | | |
| 52 | Product Silo Top BH | 0.06 | 0.50 | | | | | | | | |
| 53 | Product Silo Reclaim | 0.06 | 0.45 | | | | | | | | |
| 54 | T-200 Silo | 0.02 | 0.19 | | | | | | | | |
| 55 | Ore Recycle/Reclaim | 0.05 | 0.40 | | | | | | | | |
| 62 | Carbon Bin Vent | 0.02 | 0.13 | | | | | | | | |
| 63 | Perlite Bin Vent | 0.02 | 0.17 | | | | | | | | |
| 64 | Sulfite Blending #2 | 0.01 | 0.08 | | | | | | | | |
| 65 | Sulfite Blending #1 | 0.00 | 0.03 | | | | | | | | |
| 66 | Carbon/Perlite Scrub | 0.07 | 0.58 | | | | | | | | |
| 67 | Bottom Ash BH | 0.06 | 0.47 | | | | | | | | |
| 68 | Trona Silo/Bagging | 0.04 | 0.36 | | | | | | | | |
| 70 | Sulfite Silo/Bagging | 0.03 | 0.27 | | | | | | | | |
| 71 | MBS Silo/Bagging | 0.03 | 0.27 | | | | | | | | |
| 72 | MBS Soda Ash Feed | 0.01 | 0.07 | | | | | | | | |
| 73 | MBS Product Dryer | 0.11 | 0.90 | 0.02 | 0.15 | | | 0.10 | 0.77 | | |
| 76 | Primary Ore Screening | 0.31 | 2.45 | | | | | | | | |
| 79 | Ore Transfer Point BH | 0.11 | 0.84 | | | | | | | | |
| 80 | "D" Ore Calciner (#4) | 1.54 | 12.25 | 2.52 | 20.00 | 132.05 | 1048.00 | | | 67.22 | 533.50 |
| 81 | "D" Product Dryer | 0.06 | 0.50 | | | | | | | | |
| 82 | DR-6 Product Dryer | 0.43 | 3.45 | 3.78 | 30.00 | 1.76 | 14.00 | | | 0.03 | 0.27 |
| 83 | Product Silo Top BH | 0.05 | 0.41 | | | | | | | | |
| 85 | #3 Gas Fired Boiler | 0.06 | 0.48 | 0.48 | 3.80 | 1.14 | 9.01 | 0.01 | 0.06 | 0.03 | 0.27 |

Regional PM₁₀ Increment Consuming Sources

| | | | |
|--------|------------|------|------|
| BC1 | FMC - | 0.38 | 3.00 |
| BC2 | FMC - | 0.21 | 1.70 |
| MONO11 | FMC - | 0.38 | 3.00 |
| MONO12 | FMC - | 0.22 | 1.72 |
| MW3 | FMC - | 0.03 | 0.27 |
| RA29 | FMC - | 0.04 | 0.35 |
| | | | |
| FD617 | GEN CHEM - | 0.03 | 0.23 |
| GR3Q | GEN CHEM - | 0.19 | 1.50 |

Table 2b. Stack parameters Used in Modeling Analysis for Solvay Minerals

| AQD# | Source ID | Location | | Base Elevation (m) | Stack Height (m) | Stack Temp (°K) | Stack Velocity (m/s) | Stack Diameter (m) |
|------|-----------------------|-------------|-------------|--------------------|------------------|-----------------|----------------------|--------------------|
| | | UTM (E) (m) | UTM (N) (m) | | | | | |
| 2A | Ore Crusher | 603,661 | 4,594,980 | 1,900 | 7.01 | 293.15 | 15.85 | 1.06 |
| 6A | Top Silos | 603,893 | 4,594,835 | 1,903 | 40.54 | 309.00 | 24.99 | 0.64 |
| 6B | Silo Reclaim | 603,900 | 4,594,811 | 1,903 | 4.72 | 297.00 | 10.06 | 0.67 |
| 7 | Product Loadout | 604,045 | 4,594,861 | 1,906 | 24.99 | 293.00 | 19.51 | 0.75 |
| 10 | Coal Crushing | 603,865 | 4,594,992 | 1,900 | 4.05 | 293.00 | 5.49 | 0.60 |
| 11 | Coal Transfer | 603,873 | 4,594,820 | 1,901 | 10.76 | 293.00 | 6.40 | 0.55 |
| 14 | Boiler Coal Bunker | 603,760 | 4,594,808 | 1,902 | 38.10 | 293.00 | 17.37 | 0.43 |
| 15 | Product Dryer 1&2 | 603,719 | 4,594,814 | 1,902 | 54.86 | 347.00 | 14.94 | 1.83 |
| 16 | Product Classifier | 603,722 | 4,594,825 | 1,902 | 38.40 | 369.00 | 12.80 | 1.07 |
| 17 | A&B Ore Calciners | 603,686 | 4,594,808 | 1,902 | 55.02 | 464.00 | 13.41 | 3.66 |
| 18 | #1 Coal Boiler | 603,835 | 4,594,808 | 1,902 | 55.02 | 325.00 | 17.68 | 2.21 |
| 19 | #2 Coal Boiler | 603,835 | 4,594,780 | 1,902 | 55.02 | 322.00 | 18.29 | 2.21 |
| 24 | Boiler Flyash Silo | 603,820 | 4,594,786 | 1,902 | 7.62 | 301.50 | 12.50 | 0.30 |
| 25 | Alkaten Crushing | 603,666 | 4,595,012 | 1,900 | 23.16 | 293.00 | 14.63 | 0.73 |
| 26 | DR-3 Alkaten Dryer | 603,673 | 4,594,985 | 1,900 | 20.42 | 311.00 | 17.68 | 0.73 |
| 27 | Alkaten Bagging | 603,698 | 4,594,975 | 1,900 | 18.29 | 293.00 | 18.90 | 0.48 |
| 28 | DR-4 Product Dryer | 603,725 | 4,594,837 | 1,902 | 42.67 | 347.00 | 12.19 | 1.22 |
| 30 | Lime Bin #1 | 603,939 | 4,594,768 | 1,902 | 26.82 | 293.00 | 17.98 | 0.20 |
| 31 | Lime Bin #2 | 603,939 | 4,594,747 | 1,902 | 26.82 | 293.00 | 17.98 | 0.20 |
| 33 | Sulfur Burner | 603,892 | 4,594,725 | 1,905 | 30.48 | 339.00 | 10.67 | 0.61 |
| 35 | Sulfite Dryer | 603,929 | 4,594,725 | 1,905 | 31.39 | 327.00 | 14.63 | 0.70 |
| 36 | Sulfite Bin #1 | 603,929 | 4,594,703 | 1,905 | 18.29 | 338.00 | 25.88 | 0.15 |
| 37 | Sulfite Bin #2 | 603,943 | 4,594,703 | 1,905 | 18.29 | 338.00 | 25.88 | 0.15 |
| 38 | Sulfite Bin #3 | 603,960 | 4,594,703 | 1,905 | 18.29 | 338.00 | 25.88 | 0.15 |
| 39 | Sulfite Bin #4 | 603,974 | 4,594,703 | 1,905 | 18.29 | 338.00 | 25.88 | 0.15 |
| 41 | Sulfite Loadout | 603,987 | 4,594,724 | 1,905 | 21.34 | 338.00 | 21.34 | 0.30 |
| 44 | Lime Unloading | 603,987 | 4,594,748 | 1,905 | 19.20 | 293.00 | 17.07 | 0.30 |
| 45 | Alkaten Transloading | 604,030 | 4,594,847 | 1,906 | 5.43 | 293.00 | 8.84 | 0.27 |
| 46 | #2 Ore Transfer | 603,765 | 4,594,983 | 1,900 | 3.81 | 293.00 | 14.02 | 0.67 |
| 48 | "C" Ore Calciner | 603,686 | 4,594,846 | 1,902 | 54.86 | 450.00 | 9.75 | 3.20 |
| 50 | "C" Train Dryer | 603,713 | 4,594,847 | 1,902 | 54.86 | 366.00 | 8.23 | 1.37 |
| 51 | DR-5 Product Dryer | 603,739 | 4,594,838 | 1,902 | 54.86 | 422.00 | 10.06 | 2.44 |
| 52 | Product Silo Top BH | 603,899 | 4,594,884 | 1,903 | 42.98 | 293.00 | 15.24 | 0.46 |
| 53 | Product Silo Reclaim | 603,926 | 4,594,857 | 1,903 | 9.14 | 293.00 | 10.97 | 0.85 |
| 54 | T-200 Silo | 603,686 | 4,594,972 | 1,900 | 19.57 | 293.00 | 24.08 | 0.18 |
| 55 | Ore Recycle/Reclaim | 603,600 | 4,594,985 | 1,900 | 19.51 | 293.00 | 15.24 | 0.40 |
| 62 | Carbon Bin Vent | 603,640 | 4,594,741 | 1,900 | 27.74 | 293.00 | 25.91 | 0.15 |
| 63 | Perlite Bin Vent | 603,652 | 4,594,738 | 1,900 | 17.68 | 293.00 | 31.09 | 0.15 |
| 64 | Sulfite Blending #2 | 603,974 | 4,594,690 | 1,905 | 4.57 | 293.00 | 29.26 | 0.15 |
| 65 | Sulfite Blending #1 | 603,960 | 4,594,690 | 1,905 | 10.67 | 293.00 | 4.57 | 0.23 |
| 66 | Carbon/Perlite Scrub | 603,705 | 4,594,771 | 1,902 | 38.10 | 293.00 | 22.86 | 0.30 |
| 67 | Bottom Ash BH | 603,629 | 4,594,802 | 1,902 | 38.10 | 311.00 | 10.06 | 0.46 |
| 68 | Trona Silo/Bagging | 603,929 | 4,594,835 | 1,905 | 24.99 | 293.00 | 23.47 | 0.37 |
| 70 | Sulfite Silo/Bagging | 603,929 | 4,594,846 | 1,905 | 24.99 | 293.00 | 14.94 | 0.40 |
| 71 | MBS Silo/Bagging | 603,945 | 4,594,846 | 1,905 | 24.99 | 293.00 | 14.94 | 0.40 |
| 72 | MBS Soda Ash Feed | 603,897 | 4,594,715 | 1,905 | 18.49 | 366.00 | 16.15 | 0.20 |
| 73 | MBS Product Dryer | 603,885 | 4,594,715 | 1,905 | 28.96 | 305.00 | 17.07 | 0.61 |
| 76 | Primary Ore Screening | 603,587 | 4,594,993 | 1,900 | 33.53 | 288.71 | 17.22 | 1.12 |
| 79 | Ore Transfer Point BH | 603,486 | 4,594,996 | 1,900 | 18.29 | 288.71 | 18.26 | 0.63 |
| 80 | "D" Ore Calciner (#4) | 603,655 | 4,594,878 | 1,902 | 54.86 | 424.82 | 15.49 | 3.20 |
| 81 | "D" Product Dryer | 603,766 | 4,594,835 | 1,902 | 54.86 | 394.26 | 23.29 | 0.51 |
| 82 | DR-6 Product Dryer | 603,782 | 4,594,832 | 1,902 | 54.86 | 420.93 | 13.15 | 2.44 |
| 83 | Product Silo Top BH | 603,954 | 4,594,882 | 1,903 | 39.62 | 366.48 | 17.47 | 0.51 |
| 85 | #3 Gas Fired Boiler | 603,684 | 4,594,823 | 1,902 | 42.67 | 436.00 | 15.24 | 0.91 |

Regional PM₁₀ Increment Consuming Sources

| | | | | | | | | |
|--------|------------|---------|-----------|-------|-------|--------|-------|------|
| BC1 | FMC - | 599,153 | 4,608,435 | 1,896 | 28.35 | 350.37 | 18.63 | 0.76 |
| BC2 | FMC - | 599,153 | 4,608,484 | 1,896 | 27.74 | 312.59 | 10.35 | 0.76 |
| MONO11 | FMC - | 599,323 | 4,607,941 | 1,896 | 7.62 | 290.93 | 20.70 | 0.76 |
| MONO12 | FMC - | 599,331 | 4,608,374 | 1,896 | 18.29 | 293.71 | 17.25 | 0.91 |
| MW3 | FMC - | 599,058 | 4,608,059 | 1,896 | 39.62 | 338.71 | 18.38 | 1.98 |
| RA29 | FMC - | 598,812 | 4,608,511 | 1,896 | 24.38 | 355.37 | 29.51 | 1.22 |
| | | | | | | | | |
| FD617 | GEN CHEM - | 603,742 | 4,605,237 | 1,902 | 35.96 | 341.48 | 13.44 | 0.91 |
| GR3Q | GEN CHEM - | 603,476 | 4,605,127 | 1,902 | 35.96 | 341.48 | 13.44 | 0.91 |